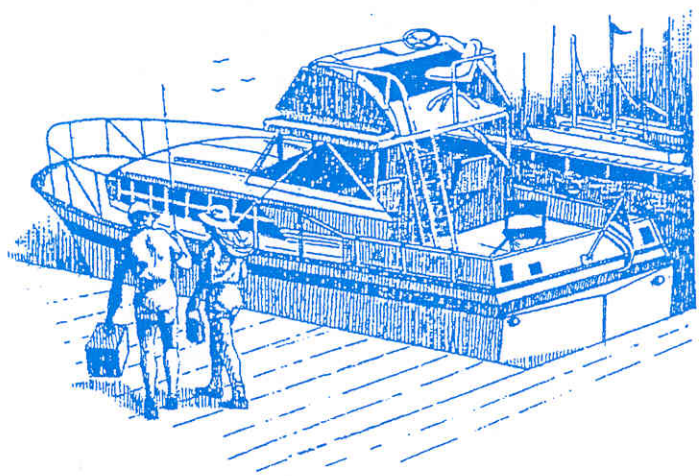
Economic Impacts of Declines in the Sport Fisheries of Eastern Lake Ontario



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ECONOMIC IMPACTS OF DECLINES IN THE SPORT FISHERIES OF EASTERN LAKE ONTARIO

by

Tommy L. Brown, Nancy A. Connelly, and Chad P. Dawson

HDRU Series 02-01

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EXECUTIVE SUMMARY

Sportfishing is a very popular recreation activity along the Eastern Basin of Lake Ontario and is very important economically to the region. In 1996, anglers spent $45.6 million in Oswego County, and $40.9 million in Jefferson County (Connelly et al. 1998). Over 93% of these expenditures were from outside the county and thus represented new dollars to the economy of each county.

A number of businesses that depend heavily on the sportfisheries of Eastern Basin experienced business declines throughout the 1990s and brought this concern to the New York State Department of Environmental Conservation (DEC), local legislators, and others. Some business owners saw this decline as a long-term trend of perhaps 20 years or more, while others saw it as more recent. The most visible culprit for the decline was the consumption of young bass and other fish species by the growing double-crested cormorant population on Little Galloo and other nearby islands in Eastern Lake Ontario. The US Fish and Wildlife Service (FWS) reported that the cormorant colony at Little Galloo Island increased from 22 nests in 1974 to 5,443 nests in 1992. The number of nests declined to 3,745 in 1994 and then increased to a second peak of 8,410 nests in 1996, followed by a decline to 5,839 nests in 1998.

Through the efforts of State Senator James W. Wright, state funds were obtained for this study of trends in the Eastern Lake Ontario sportfisheries and of the economic impacts of the decline in the fisheries. This study was administered by the Lake Ontario Fisheries Coalition (LOFC). The LOFC leaders viewed the decline in the sportfisheries and coastal tourism as long-term, and thus, the study examined tourism and coastal fishing trends over a 20-year period. The study area was defined as the Eastern Lake Ontario portions of Jefferson and Oswego Counties. The St. Lawrence River was excluded from the study because of basic differences between the fisheries of the St. Lawrence and Eastern Lake Ontario.

Methods

The study methods consisted of (1) analysis of secondary fishing, boating, and coastal tourism data over a 20-year period, (2) re-analysis of data from the 1988 and 1996 New York statewide angler surveys, and (3) a survey of businesses that rely upon sportfishing in the study area to estimate changes in sales since 1996. Appropriate multipliers were applied to final impact data using IMPLAN, a nationally renowned software package for community and regional economic impact analysis.

Results

Jefferson and Oswego Counties are similar in population and in population trends in recent decades, with an increase in the 1980's and stabilization afterward. The majority of the population of both counties was classified as rural in 1990. The two counties also are not substantially different with respect to the relative importance of the various employment sectors.

A major difference between the two counties is that 32% of Oswego County residents commuted outside the county to work (primarily to Onondaga County) in 1990, whereas only 6% of Jefferson County residents are employed outside the county.

Fishing License Sales and Participation

Statewide, Jefferson County, and Oswego County total (resident and nonresident) license sales curves for the years 1980-2000 have similar shapes. However, while license sales statewide were down 16.2% between the peak year of 1990 and 2000, sales in Oswego County were down by 32.5%, and sales in Jefferson County were down by 29.9% from their peak year, 1989.

Oswego County's license sales patterns have been unique historically because of the excellent salmonid fishing in the Salmon River and tributaries. Warmwater fisheries are also important in Oswego County, but salmonid fisheries are of less importance in Jefferson County, where the warmwater fisheries predominate. However, in both counties, substantially steeper license sales declines than the statewide norm would indicate that one or more factors not prevalent statewide have been present in the two counties over the past decade or so.

Trends in angler days fished in New York in 1996, compared to 1988, are very different for the Great Lakes versus inland waters. Angler days on Lake Ontario for the two-county area declined by 20.7% during this period. Angler days for the rest of Lake Ontario outside the two-county area declined by 24.3% from 1988 to 1996. Angler days for the rest of New York increased by an average of almost 20% over the same time period.

DEC conducts an annual Fishingboat Census on Lake Ontario. The data cannot be separated by county. Lakewide, boat trips have declined from an average of 186,345 in 1985-89, to 93,257 in 1998; the last two years have seen slight increases of 4,000 to 5,000 anglers from the 1998 low number.

Annual measures of the number of charter boats on Lake Ontario and the St. Lawrence River are not available. The three data points that are available show about 450 boats in 1987, 560 in 1990 and 400 in 1994.

Boating and Tourism Trends

Boat registration data indicates a fairly steady growth for both Oswego and Jefferson Counties since 1980. From 1990 to 1998, boats registered as having primary use in Oswego County increased by 41%; the comparable gain in Jefferson County exceeded 30%. Average annual tourism employment in Jefferson County peaked in 1990 at 5,154, then declined annually to 4,462 in 1995 before rebounding partially to 4,738 in 1999. Tourism-related employment in Oswego County, on the other hand, has shown steady growth from 1,659 in 1980 to 3,724 in 1999.

Estimates of Fishing Declines, 1988 to 1996

From the New York statewide angler surveys of 1988 and 1996, angler expenditures in constant 1996 dollars declined by $1.93 million in Jefferson County, and by $5.03 million in Oswego County, or by $6.96 million in the two counties between 1988 and 1996. It should be noted that statistically, because the data were obtained from samples of angler populations, we can't say at the 95% level of confidence that there were declines in angler days in Jefferson County, or declines in total angler expenditures in either of the counties from 1988 to 1996. However, there clearly was a decline in the total number of different individual anglers who fished in both counties from 1988 to 1996. Given the data on number of individual anglers and the concerns brought by coastal businesses, we will assume that the difference between 1988 and 1996 estimates are accurate. Statistically, there is equal probability of a greater versus lesser economic impact than the estimate of $6.96 million.

We estimated the proportion of the nearly $26.4 million in angler-related expenditures (or business-related sales) in 1996 that occurred in various sectors by averaging proportions reported in the New York portion of the 1991 U.S. Fish and Wildlife Service survey and the 1989 Salmon River survey. This step lets us allocate the $6.96 million decline reported above to various economic sectors.

Survey Results: Changes in Business Activity from 1996 to 2001

We mailed 306 questionnaires to businesses to estimate changes in sales from 1996 to 2001, and we received an adjusted response rate of 45% of deliverable questionnaires. Twelve additional surveys were completed by telephone, resulting in a data set with 142 cases. This represents 49% of businesses that had the potential to respond. A concerted effort was made to reach more businesses by phone, but many operators simply were not available during the holiday period of mid to late December when contacts were attempted.

Respondents provided employment data by (1) year-round versus seasonal, (2) part-time versus full-time, and (3) owners versus paid employees. Expanding the data from the responding businesses to all 291 businesses indicates that over 2,000 people were employed in tourism-related businesses associated with eastern Lake Ontario in 2001. Almost all respondents identified boating or fishing as moderate or strong factors for the success of their business. However, most businesses also felt the general economy had a significant effect on their success in recent years.

Respondents were asked to compare sales in each subsequent year through 2001 to sales in 1996. A majority of marinas indicated a decrease in sales for 1997 through 1999 compared with 1996. Most charterboat and guide services indicated a decrease in 2000-2001 from 1996. On the other hand, the majority of accommodations, food, and other retail service businesses indicated an increase in sales for each subsequent year, compared with 1996.

In constant 1996 dollars, sales have remained flat for the accommodations and food sectors. However, sales at marinas have been at about 10% below 1996 levels. Charterboat and guide services indicated a decline in sales compared with 1996, which became more precipitous in 2000 and 2001.

Some differences in sales were observed between counties, with marinas in Oswego County reporting slightly larger decreases in sales than in Jefferson County. The difference was reversed for accommodations and food services, with slightly positive numbers for Oswego County and slightly negative numbers for Jefferson County. The general decrease in charterboat and guide services over time was particularly pronounced for businesses with addresses in Jefferson County.

Businesses for which fishing was important had on average a decrease in sales in all subsequent years compared with 1996, and a marked decline in 2000 and 2001. The few businesses in our sample for which fishing was only slightly important, on average, had increases in sales for all years compared with 1996.

For businesses that reported increased sales, word of mouth or increased repeat business was most frequently cited. Improved marketing was mentioned by many businesses and expanded products or services was particularly common among marinas and other retail sales businesses. Increased tourism was not perceived by many as a reason for increased sales. Other reasons noted included improved facilities and services, increased fees, and good fishing.

For businesses reporting decreased sales, fewer fish for anglers due to cormorant depredation was the most commonly cited reason and was listed by 85% of charterboat/guide service operators and many respondents in other business sectors. Cormorant depredation was checked by significantly more Jefferson County businesses (88%) than Oswego County businesses (51%). About 40% indicated a general decline in the economy and changing patterns in location of fish as reasons for declining sales. General decreases in tourism was mentioned by one-third of respondents. Many respondents noted a general decline in the number of fish, without attributing a specific cause.

Estimating Dollar Change in Sales, 1996-2001

Not all business sectors that serve anglers experienced declines between 1996 and 2001. This is because tourism in the region generally was increasing during this time. However, the businesses that experienced gains in constant dollar business volume between 1996 and 2001, if they had the capacity for additional business, would have experienced even greater sales if the total number of anglers had remained constant or increased.

Marinas have experienced additional losses in constant dollars in every year from 1996 to the present, and in 2001 lost nearly $350,000. Charter and guide services declined even more steeply and lost roughly $555,000 in 2001 from 1996 levels. We have no way to estimate losses to food,

lodging, and other retail service establishments because anglers, while an important clientele, would likely constitute a minority of the total clientele of these businesses.

Estimated Total Annual Impacts of Fishing Declines

A conservative estimate of the total annual dollar losses from the 1986 level of fishing activity in Jefferson and Oswego Counties through 2001 is $7.87 million in constant 1996 dollars, or about $8.70 million in constant 2002 dollars. This is the sum of the 1988 to 1996 declines in fishing, plus the additional estimated losses from 1996 to 2001 to the marina and charter fishing sectors. This estimate is conservative because it does not include other trip-related expenditures anglers would have made had they used marinas and had they gone charterfishing in 2001 at 1996 levels.

Applying the IMPLAN economic impact model requires converting data to 1998 constant dollars. In 1998 dollars, we estimate direct losses to coastal businesses of $8,178,000 million for 2001, compared to 1986 (Table 1). The total impact of this decline in expenditures across the two-county economy is estimated at $10,945,393. IMPLAN estimates this loss as being the equivalent of 186.1 direct jobs, or 227.4 total jobs. These are not all full-time jobs but are a combination of full-time and part-time jobs.

Table 1. Estimated economic declines in fishing in Jefferson and Oswego Counties, 2001 compared to 1986, represented in 1998 constant dollars.

Category	Total Dollar Declines by Sector
Fishing tackle, bait (Sporting goods stores)	$ 853,000
Boating-related expenses (Marinas)	1,225,000
Automobile fuel and expenses	1,194,000
Lodging	1,462,000
Restaurant - Bar	1,332,000
Groceries	442,000
Charterboat and guide fees	1,149,000
Miscellaneous retail expenses	521,000
Total	$ 8,178,000

Discussion

We believe the data sources we used, including the follow-up business survey, were the best options available to us to make this assessment. We feel reasonably confident that we have documented at the correct order of magnitude a large decline in coastal fishing and boating-related activity over the 13-year period between 1988 and 2001. Probably most of the jobs lost would be seasonal jobs, but nevertheless, a decline of over 200 jobs indicates the importance of sportfishing to the local economy.

This study was funded in large part by a desire to see an estimate of the extent to which this decline in fishing, particularly in Jefferson County, was due to depredation of double crested cormorants on smallmouth bass and other species. There is evidence from DEC biological data that cormorants are having some impact. The business community believes that cormorants are having an impact, and that anglers believe cormorants are affecting their fishing success.

Cormorants have received a substantial amount of publicity by the media, which may well have influenced angler beliefs independent of anglers' actual experience. Putting a dollar value on the portion of the decline that is attributable to cormorants is impossible, however.

Trends in fishing in New York and across the Great Lakes between 1988 and 1996 are different for the Great Lakes versus inland waters. Fishing effort was down across the Great Lakes during this period. Indeed, the decline for Jefferson County was less than that for areas of Lake Ontario. However, the fact that tourism outside of fishing was reasonably strong in the area, and the large increase in fishing effort on the St. Lawrence River suggests that fishing may well have been substantially better in the Lake Ontario portion on Lake Ontario without the direct effect of the cormorants, the negative media publicity generated by the cormorants, and increased water clarity factors that influenced fish habitat and locations.

We don't have the data to specify the reasons for declines in Great Lakes fishing with certainty, but some additional factors may also be operating. Demographic trends plus a lower recruitment of youth into fishing in recent years may be a factor. The negative media attention given to factors other than cormorants, such as zebra mussels and other exotics, and lowered productivity of the lakes, may also be a factor. And for some anglers, the novelty of Great Lakes fishing, especially for salmonids, simply may have worn off.

We believe that expanded cormorant populations are a cause for concern and that controls are badly needed. At the same time, we recommend that the fisheries community and community economic interests take a closer look at the broader factors that are affecting Great Lakes fishing, and try to determine the extent to which strategies can be developed to reverse this trend.

INTRODUCTION

Sportfishing is a very popular recreation activity along the Eastern Basin of Lake Ontario. Market studies (e.g., a 1999 SRDS Market Lifestyle Analyst study, and a 1998 Jefferson County Tourism Industry profile) indicated that 33% of households in Jefferson County contain a member who fishes regularly, and that the Watertown Demographic Market Area has the highest percentage of anglers in the population of any such DMA in New York State (Bridge Associates circa 2001). Sportfishing is also very important economically to the region. In 1996, anglers spent $45.6 million in Oswego County, and $40.9 million in Jefferson County (Connelly et al. 1998). Over 93% of these expenditures were from outside the county and thus represented new dollars to the economy of each county.

A number of businesses that depend heavily on the sportfisheries of Eastern Lake Ontario saw declines in their business receipts throughout the 1990s and brought this information to the New York State Department of Environmental Conservation (DEC), local legislators, and others. Some business owners saw this declining trend as a long-term trend of perhaps 20 years or more, while others saw it as more recent. The most visible culprit for the decline was the consumption of young bass and other fish species by the growing double-crested cormorant population on Little Galloo and other nearby islands in Eastern Lake Ontario.

The DEC's Bureau of Fisheries and the U.S. Geological Survey's Biological Resources Division conducted studies in 1998 to assess the impact of cormorants on the fisheries of the Eastern Basin of Lake Ontario (Schneider et al. 1999). The results of several efforts were compared with similar if not directly comparable data from previous years. Among the findings were:

1. Annual numbers of warmwater fish caught in DEC net gangs dropped from 200 to 250 fish in 1976-79, to about 20 in 1997-98;

2. Approximately 36,000 smallmouth bass were harvested by anglers in 1998, which compares to 183,000 in 1978 and 90,000 in 1984. Angler catch per unit effort in 1998 was roughly half of the level in previous years;

3. The total number of fishing participants in 1998 was not obviously less than in previous years, but different methods were used. An expanded walleye fishery in recent years may have helped total numbers of anglers remain at somewhat comparable levels; and

4. About 1.3 million smallmouth bass were eaten by cormorants.

History of Cormorant Populations on Lake Ontario

Cormorants were first reported on Lake Ontario around 1910, with the first nesting occurring in the 1930's. In the 1940's they reportedly began nesting on Gull Island, New York and then turned exclusively to Little Galloo Island in the 1970's. The US Fish and Wildlife Service (FWS) reports that the cormorant colony at Little Galloo Island increased from 22 nests in 1974, to 276 nests in 1980, 1,419 nests in 1986, 4,072 nests in 1990, and 5,443 in 1992. The number of nests declined to 3,745 in 1994 and then increased to a second peak of 8,410 nests in 1996, followed by a decline to 5,839 nests in 1998.

In 1992, cormorants recolonized Gull Island and began to colonize additional islands in New York, such as Bass and Calf Islands. Cormorants expanded into the St. Lawrence River by 1996 when one nest was reported in St. Lawrence County. By 1997, 727 cormorant nests were counted at three sites in Canada adjacent to St. Lawrence County. The U.S. and Canadian Eastern Basin and upper St. Lawrence River cormorant nesting population were estimated at approximately 8,000 nesting pairs in 1998.

Concerns Increase about Cormorant Impacts

The Eastern Lake Ontario islands and the surrounding shoals are considered to be a significant coastal fish and wildlife habitat by New York State. These resources comprise a rare ecosystem in New York State and provide important habitat for colonial waterbirds, waterfowl, shorebirds and warmwater fishes. Little Galloo Island is recognized by state law as an Important Bird Area. Recent expansion of cormorant nesting to new islands in the Eastern Basin of Lake Ontario and the upper St. Lawrence River could negatively impact habitat for other birds, and an overall increase in cormorant numbers reportedly has negative impacts on smallmouth bass populations and fishing opportunities.

Cormorants can displace nesting herons and egrets, and in Lake Ontario islands they may displace nesting of black-crowned night-herons, a locally rare species in northern New York. On islands with trees, cormorants will build their nests in trees before moving to ground nesting, and may fill most branches with nests. Eventually, the cormorant feces that accumulate on the ground will lead to the death of the trees and cause substantial changes in ground vegetation.

On Lake Ontario, the DEC has managed cormorants to reduce competition with black-crowned night-herons and to protect vegetation on unique island communities. Active management of the cormorant colony on Little Galloo Island may help to prevent the expansion of cormorants to other sites, and would maintain or slightly reduce the overall Eastern Basin cormorant population.

Lake Ontario supports the largest freshwater sport fishery in the state, the warmwater component of which has been a highly productive smallmouth bass fishery, concentrated primarily in the Eastern Basin. Anecdotal accounts of the smallmouth bass fishery from anglers, charter operators, local business owners, and DEC law enforcement officers indicate that fishing

quality and participation have declined over the last several years to a historic low point. Local communities and businesses who benefit economically from the fishery resource reported lost revenues, but there were no estimates of economic loss related to the declining smallmouth bass fishery prior to this report. A series of studies (NYSDEC and USGS 1999, 2000 and 2001) have demonstrated that in recent years, predation by cormorants has been a major contributor to juvenile mortality and depressed population levels of the adult bass population in the Eastern Basin of Lake Ontario. Control of cormorant populations would likely reduce predation on juvenile bass and, thus, increase the probability of recovery of the adult bass population to desired sportfishery levels. However, the DEC points out that although cormorant predation has been identified as having negative impacts on smallmouth bass populations, other factors, both natural and human caused are also negatively impacting these populations.

Cormorant Management by DEC and FWS

Since 1994, the FWS has authorized the DEC to manage cormorant populations on Bass and Gull Islands by destroying nests to prevent egg hatching, with a stated goal of reducing impacts to nesting black-crowned night-herons. Removal of cormorant nests has prevented encroachment of these nests into the vegetation used by black-crowned night-herons. In 1997, cormorants began nesting on Calf Island and these nests were destroyed by DEC. Destruction of cormorant nests has been carried out annually on Bass, Gull, and Calf Islands and night-heron populations have remained relatively stable on these islands.

In 1999, the DEC was granted authority from the FWS to implement a one-year pilot study involving the oiling of cormorant eggs on Little Galloo Island with the intent to eventually reduce the cormorant population within New York waters to 1,500 breeding pairs over a five-year period (USDI 1999). The FWS required the DEC in 1999 to simulate a 10-year mathematical model to predict the outcome of future cumulative effects of oiling eggs to reduce hatching. The model predicted that nest control would be necessary through 2008 in order to achieve the intended objective of 1,500 pairs in the U.S. Eastern Basin.

In 2001, the FWS reauthorized the DEC to continue to control cormorant populations using three approaches: (1) to kill, using shotguns, up to 40 double-crested cormorant depredating fish at stocking locations in Lake Ontario; (2) to destroy up to 1,500 double-crested cormorant nests (and all eggs) at Bass, Gull, and Calf Islands when they are competing with black-crowned night-herons or causing damage to vegetation and to additionally destroy up to 500 rebuilt nests on subsequent visits; and (3) to limit reproduction by applying oil to all eggs in up to 6,000 double-crested cormorant nests on Little Galloo Island. The need for this federal permit in 2001 was reportedly due to continued negative impacts on other nesting birds and their habitats from the elevated populations of cormorants in eastern Lake Ontario and their expansion into the Upper St. Lawrence River.

Study results to date show that populations of cormorants continue to increase and expand following control efforts: “In 1999, the year extensive cormorant nest control began in New York waters, cormorants nested at seven islands in the Eastern Basin (9,478 nests) and six

islands in the Upper St. Lawrence River (625+ nests), for a total area population of 10,103 nests before control. In 2000, the second year of extensive control, the area cormorant population increased to 13,313 nests (32% increase)" (USDI 2001). These results are within the predicted range of the 10-year model estimates and reflect more nest rebuilding and more movement to other islands than had been expected. However, since the results are within overall limits and the project is only two years into a ten-year plan, the continued control efforts have been re-authorized. The FWS Environmental Action Statement authorizing these DEC management actions projects a long-term decline in the cormorant populations based on continued management.

Impetus for this Study

Through the efforts of State Senator James W. Wright, state funds were obtained for a study of trends in the Eastern Lake Ontario sportfisheries and of the economic impacts of the decline in the fisheries. This study was administered by the Lake Ontario Fisheries Coalition (LOFC) under the leadership of its president, Franklin D. Cean. Contracting for the study was facilitated by the Jefferson County Job Development Corporation under the leadership of James B. Edmonson, Executive Director. The Human Dimensions Research Unit (HDRU) at Cornell University, in association with Dr. Chad Dawson of Vista Consulting, was selected in April, 2001, to do the study.

METHODS

An initial meeting between the LOFC leaders and the researchers revealed that the decline in the sportfisheries and in coastal tourism was generally viewed as a long-term decline, and as a result, tourism and coastal fishing trends should be examined over a 20-year period. The study area was defined as the Eastern Lake Ontario portions of Jefferson and Oswego Counties. The St. Lawrence River was excluded from the study because of basic differences between the fisheries of the St. Lawrence and Eastern Lake Ontario.

Secondary Data Analysis

The general strategy for the study was to first examine tourism and fishing trends from 1980 to the most recent year available and to graph those trends. Examination of several sources of data would provide insight, for example, as to whether trend directions related to sportfishing and general tourism in Jefferson and Oswego Counties were similar or quite different. From those data, we could better understand the trends in numbers of anglers and expenditures related to fishing, in comparison with general travel and tourism trends in the two-county area. Then, we compared fishing trends in Eastern Lake Ontario to trends statewide and nationally to get a perspective on any declines in fishing that appeared to be unique to Eastern Lake Ontario.

In our judgment, the best single data source for a comparison of angler effort and expenditures (or sales to the local business community) is the statewide angler surveys conducted in 1988 and 1996 by the Human Dimensions Research Unit at Cornell University for

DEC. These surveys were conducted by mail from a statewide sample of both resident and nonresident license holders. The sample size of these surveys is large enough to derive reasonable estimates of days fished and expenditures of anglers who fish the portions of Lake Ontario in Oswego and Jefferson Counties. These data bases are held at Cornell and were used to estimate fishing-related declines between 1988 and 1996.

To apply multiplier estimates of the larger effects of the 1988 to 1996 fishing declines, it is necessary to estimate angler expenditures within each major economic sector. The New York statewide angler surveys ask only for total expenditures for each fishing location; they do not obtain expenditures by sector. Two sources of angler expenditures were examined and considered for making estimates by sector: (1) statewide data for angler trip expenditures in New York, from the 1991 national survey by the U.S. Fish and Wildlife Service; and (2) angler expenditures on the Salmon River in 1989 (Connelly et al. 1990).

We examined these data closely and concluded that an average of the two data sets would provide the best available estimates of proportional expenditures within sectors for Oswego and Jefferson Counties. The Salmon River is in the study area and thus, those expenditure patterns deserve some weighting. However, compared to all coastal fishing in the two counties, a disproportionate number of Salmon River anglers come from out of state and therefore have more lodging expenses than other anglers, and at the time of the Salmon River study, a disproportionate number of anglers purchased snagging hooks and other equipment at sporting goods stores. In addition, although the Salmon River estuary is fished by boat, we believe Salmon River data alone would underestimate expenditures made at marinas in the broader two-county coastal area. The U.S. Fish and Wildlife study does not separate out food and lodging expenditures into restaurant/bar, grocery, and lodging expenses; we have used the Salmon River data to estimate these proportions within the food and lodging category.

Business Survey

To provide updated estimates of fishing-related business volume since 1996, the year of the most recent statewide angler survey, we designed a mail survey to estimate business trends over the past five years for firms that derive significant portions of their revenues from the Eastern Lake Ontario fisheries. Names and addresses of tourism-related businesses in Oswego and Jefferson Counties were obtained from their respective county tourism promotion agencies. A total of 306 questionnaires were mailed out on October 10, 2001. Up to three follow-up reminder letters were used to encourage business owners to respond. Mail questionnaires were sent to all fishing and boating-related businesses (i.e., charterboats, fishing guides, sporting goods stores, marinas, and taxidermists) in the two counties, except businesses with addresses adjacent to Oneida Lake and the St. Lawrence River east of Cape Vincent. Questionnaires also were sent to all lodging businesses, campgrounds, and restaurants in coastal towns (including Pulaski) along the eastern shore of Lake Ontario up to and including Cape Vincent.

The mail questionnaire asked business owners to describe their businesses, indicate the dates of operation, and the number of employees. It also asked owners to compare their recent annual

sales with that of 1996 (or a more current base year, if data for 1996 were unavailable). Respondents were asked to identify factors that may have positively or negatively affected sales in the past five years.

Returned questionnaire data were entered into the computer by HDRU staff and analyzed using the SPSS statistical software program (SPSS for Windows, Release 10.1.4). Telephone interviews were conducted with a randomly selected group of nonrespondents from fishing and boating-related businesses in an attempt to increase the number of responses from these businesses, as they are potentially most heavily impacted by changes in the fishery, and to see if any differences could be detected between respondents and nonrespondents.

IMPLAN Analysis

As part of this project, we used IMPLAN software (Minnesota IMPLAN Group Inc. 2001) to estimate the indirect impacts of declines in the sportfisheries on the economy of the region. IMPLAN, originally developed by economists at the U.S. Forest Service, has been privatized but remains one of the most respected software analysis packages for estimating various multipliers and impacts of new expenditures or losses in expenditures on the economy of a region. The software uses business data collected by the federal government as the basis for estimating sales, employment, and income multipliers.

RESULTS

General Profiles of Jefferson and Oswego Counties

Jefferson and Oswego Counties are similar in population and in population trends in recent decades, with an increase in the 1980's and stabilization after that (Table 1). The majority of the population of both counties was classified as rural in 1990. The two counties also are not substantially different with respect to the relative importance of the various economic sectors for employment (Table 2). A greater portion of Oswego County employment is in manufacturing, although some of that employment likely is in Onondaga County. The larger percentage of public administration employment in Jefferson County reflects primarily the influence of Fort Drum. A major difference between the two counties is that 32% of Oswego County residents commuted outside the county to work (primarily to Onondaga County) in 1990, whereas only 6% of Jefferson County residents are employed outside the county (Eberts 1994). Oswego County is classified as part of the Syracuse Metropolitan Statistical Area (MSA).

Table 1. Population of Jefferson and Oswego Counties, 1970-2000.

Year	Jefferson	Oswego
1970	88,508	100,897
1980	88,151	113,901
1990	110,943	121,771
2000	111,738	122,377

Table 2. Employment distribution by major economic sectors in Jefferson and Oswego Counties, 1990 (Source: Bureau of the Census).

Sector	Jefferson	Oswego
Agriculture, forestry, fisheries	4.2%	1.7%
Mining	0.2	0.1
Construction	7.7	8.4
Manufacturing	13.5	21.1
Transportation	4.0	4.1
Communications and other public utilities	2.6	6.9
Wholesale trade	2.8	3.3
Retail trade	19.3	18.0
Finance, insurance, real estate	4.3	4.0
Business and repair services	2.9	3.2
Personal services	2.9	2.2
Entertainment and recreation services	1.0	0.8
Health services	9.4	6.6
Educational services	9.3	11.8
Other professional and related services	5.8	4.8
Public administration	10.0	3.0

Fishing License Trends: Statewide, Jefferson, and Oswego Counties

Our first examination was to see whether the trend in fishing license sales in Jefferson and Oswego Counties differed from the statewide trend. Fishing license sales statewide in New York have declined since around 1990. To make the case that cormorant depredation was contributing to declining business in coastal Jefferson and Oswego Counties, we would expect to be able to show a sharper decline in license sales in Jefferson and Oswego Counties than statewide.

A comparison of license sales is shown in Figure 1. The statewide, Jefferson County, and Oswego County total (resident and nonresident) license sales curves for the years 1980-2000

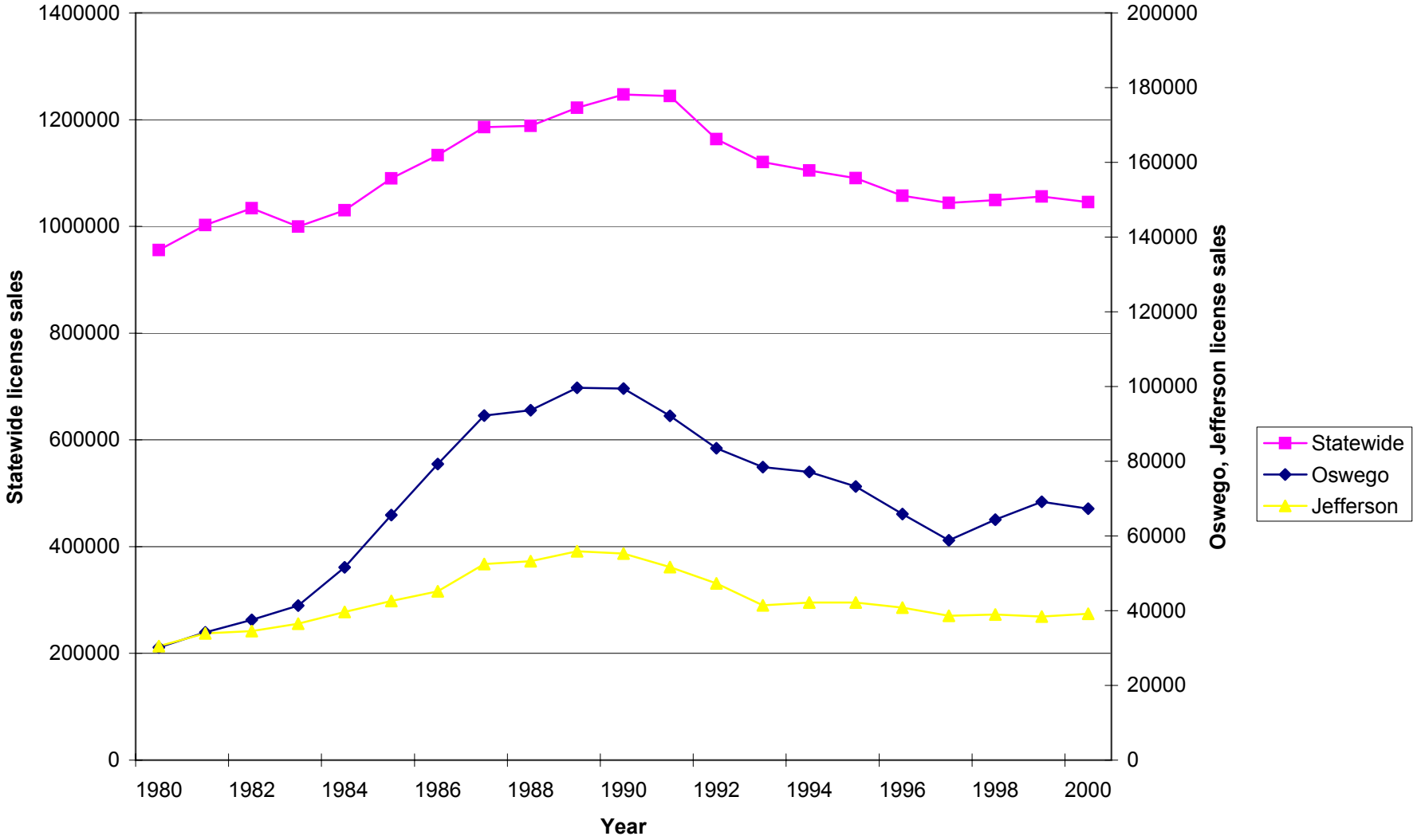

Figure 1. New York, Jefferson, and Oswego County fishing license sales.

have similar shapes. However, total sales statewide were down 16.2% between the peak year of 1990 and 2000. In contrast, sales in Oswego County were down by 32.5%, and sales in Jefferson County were down by 29.9% from the peak year, which was 1989 for both counties. In Oswego County, where non-resident license sales exceeded resident license sales by more than 2:1 between 1987 and 1995, non-resident sales dropped by almost 50% between 1989 and 1997 before regaining about 20% of this loss in subsequent years (Figure 2). In Jefferson County, where resident license sales now out-number non-resident sales by more than 2:1, nonresident sales dropped by 48% between 1987 and 2000. Unlike Oswego County, however, Jefferson County's non-resident sales have continued a slight decline from 1997 to 2000 (Figure 3).

Oswego County's license sales patterns have been unique historically because of the excellent salmonid fishing in the Salmon River and tributaries. Warmwater fisheries are also important in Oswego County, but salmonid fisheries are of less importance in Jefferson County, where the warmwater fisheries predominate. However, in both counties, substantially steeper license sales declines than the statewide norm indicate that one or more factors not prevalent statewide have been present in the two counties over the past decade or so.

Trends in angler days fished in New York in 1996, compared to 1988, are very different for the Great Lakes versus inland waters. Angler days on Lake Ontario for the two-county area declined by 20.7% during this period. Most of the decline was in Oswego County; angler days in Jefferson County declined by only about 8%. Angler days for the rest of Lake Ontario outside the two-county area declined by 24.3% from 1988 to 1996. Angler days for the rest of New York increased by an average of almost 20% over the same time period.

Great Lakes Fishing Trends

The U.S. Fish and Wildlife Service (FWS) estimates that from 1991 to 1996, the number of anglers fishing the Great Lakes and the total number of angler days dropped by just over 20%. Comparable lake by lake data are not available because FWS included data on connecting waters in their estimates for individual Great Lakes in 1996, but not in 1991. While these data are not directly comparable, they appear to show an increase in angler days from 1991 to 1996 for Lake Superior, and a decrease for Lakes Michigan, Huron, and Erie. The Lake Ontario data are difficult to interpret–they show a 32% increase from 1991 to 1996, but the 1996 estimate includes the entire Niagara River as well as the Salmon River and other tributaries. While the sample size for St. Lawrence River fishing is too low to be highly reliable, FWS data show a substantial increase in angler days on the St. Lawrence River from 1991 to 1996. The 2001 survey results are not yet available; thus as yet there are no federal data on Great Lakes fishing trends after 1996.

From the New York 1988 and 1996 statewide angler surveys, the number of angler days spent on Lake Ontario and its embayments dropped by 32.6% from 1988 to 1996. A decline of 35.6% in angler days also occurred on Lake Erie. The number of angler days on the St. Lawrence River, on the other hand, increased by 28.7% from 1988 to 1996.

DEC conducts an annual Fishingboat Census on Lake Ontario. The data cannot be separated by county. Lakewide, boat trips have declined from an average of 186,345 in 1985-89, to 93,257

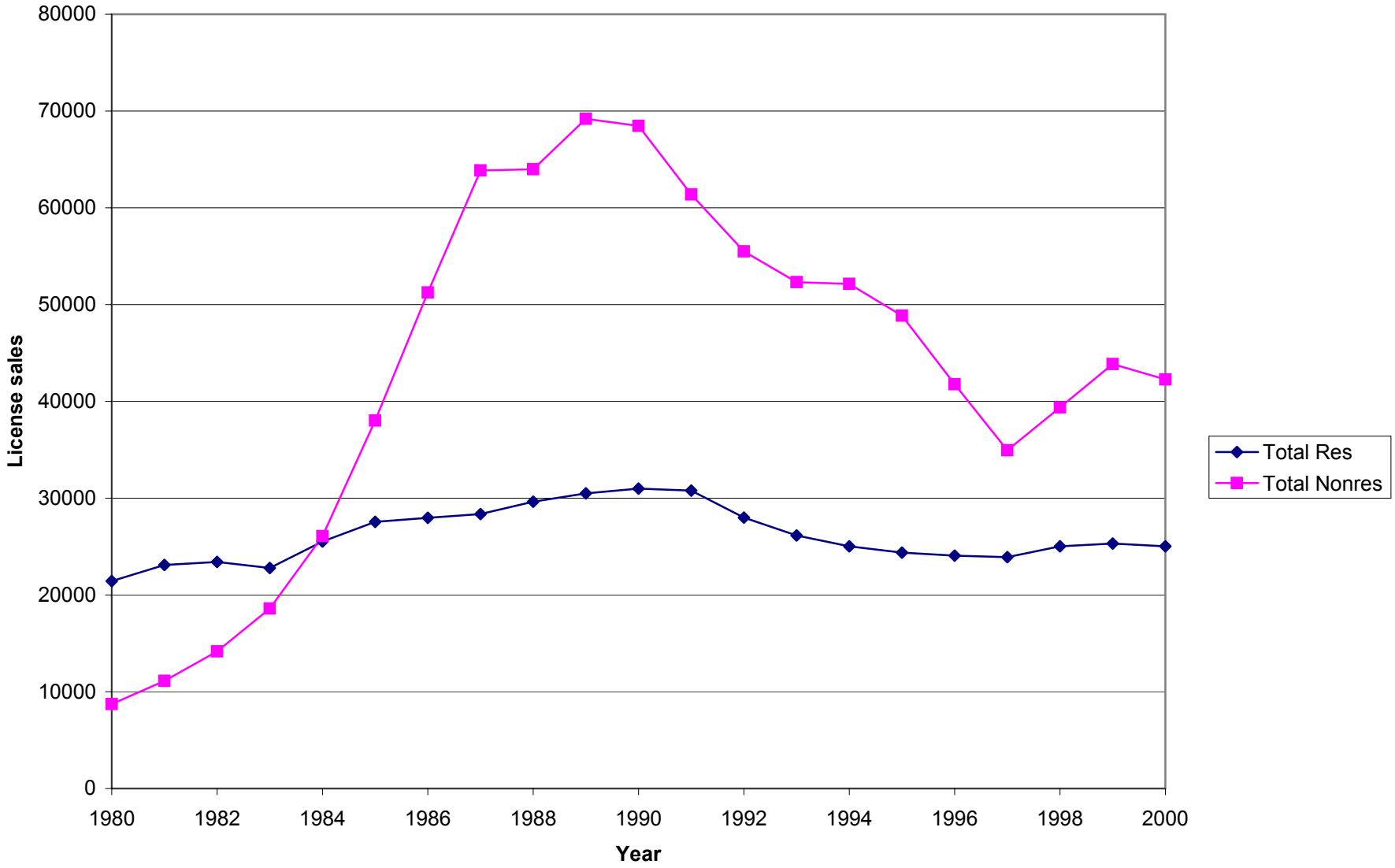

Figure 2. Resident and nonresident fishing license sales in Oswego County.

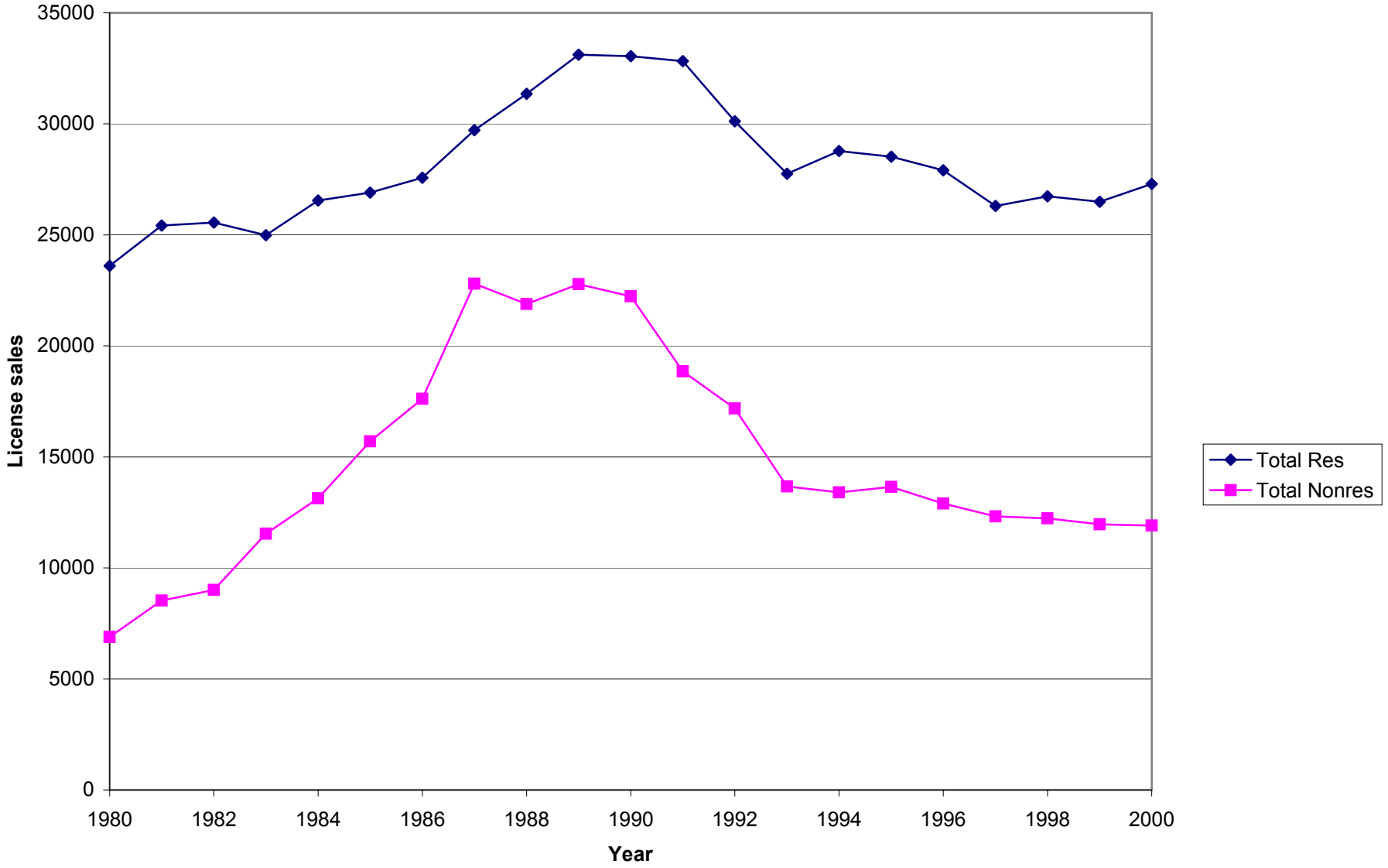

Figure 3. Resident and nonresident fishing license sales in Jefferson County.

in 1998 (Figure 4); the last two years have seen slight increases of 4,000 to 5,000 anglers from the 1998 low number. The harvest rate for trout and salmon was substantially lower in 1995 and 2,000, compared to other years. The harvest rate for smallmouth bass reached an all-time high in 1999 and declined somewhat in 2000.

Annual measures of the number of charter boats on Lake Ontario and the St. Lawrence River are not available. The three data points that are available show about 450 boats in 1987, 560 in 1990 and 400 in 1994.

Boating Trends

Boat registration data from New York Department of Motor vehicles show a fairly steady growth for both Oswego and Jefferson Counties since 1980 (Figure 5). From 1990 to 1998, boats registered as having primary use in Oswego County increased by 41%; the comparable gain in Jefferson County exceeded 30%.

Overall Tourism Trends

Average annual tourism employment in tourism-related sectors in Jefferson County peaked in 1990 at 5,154, then declined annually to 4,462 in 1995 before rebounding partially. Total employment in 1999 was 4,738 (Figure 6). Eating and drinking places had over 50% of the total tourism-related employment for most of this period and generally mirrored this trend. Marina employment has been at roughly 100 people since 1992, but had a peak of 128 in 1987. Employment with boat dealers peaked at 108 in 1989 and has gradually declined since to only 56 employees in 1999.

Tourism-related employment in Oswego County, on the other hand, has shown steady growth from 1,659 in 1980 to 3,724 in 1999 (Figure 7). About 75% of this employment is in eating and drinking places. Lodging employment peaked in 1992 at 209 and declined in every year since except 1996, to only 128 in 1999. Many of Oswego County's anglers come from out of state and other regions of the state and therefore would stay overnight. As we will see in the section on fishing trends, the declines in fishing since 1988 likely has had a notable effect on lodging employment.

Estimates of Fishing Declines, 1988 to 1996

Table 3 documents the decline in angler days and local expenditures for anglers fishing the Lake Ontario shoreline of Jefferson and Oswego counties from 1988 to 1996. These data are from DEC studies conducted by the Human Dimensions Research Unit at Cornell University, using the same methods. It should be noted that statistically, because the data were obtained from samples of angler populations, we can't say at the 95% level of confidence that there were declines in angler days in Jefferson County, or declines in total angler expenditures in either of the counties from 1988 to 1996. However, there clearly was a decline in the total number of different individual anglers who fished in Jefferson County, and in Oswego County, from 1988

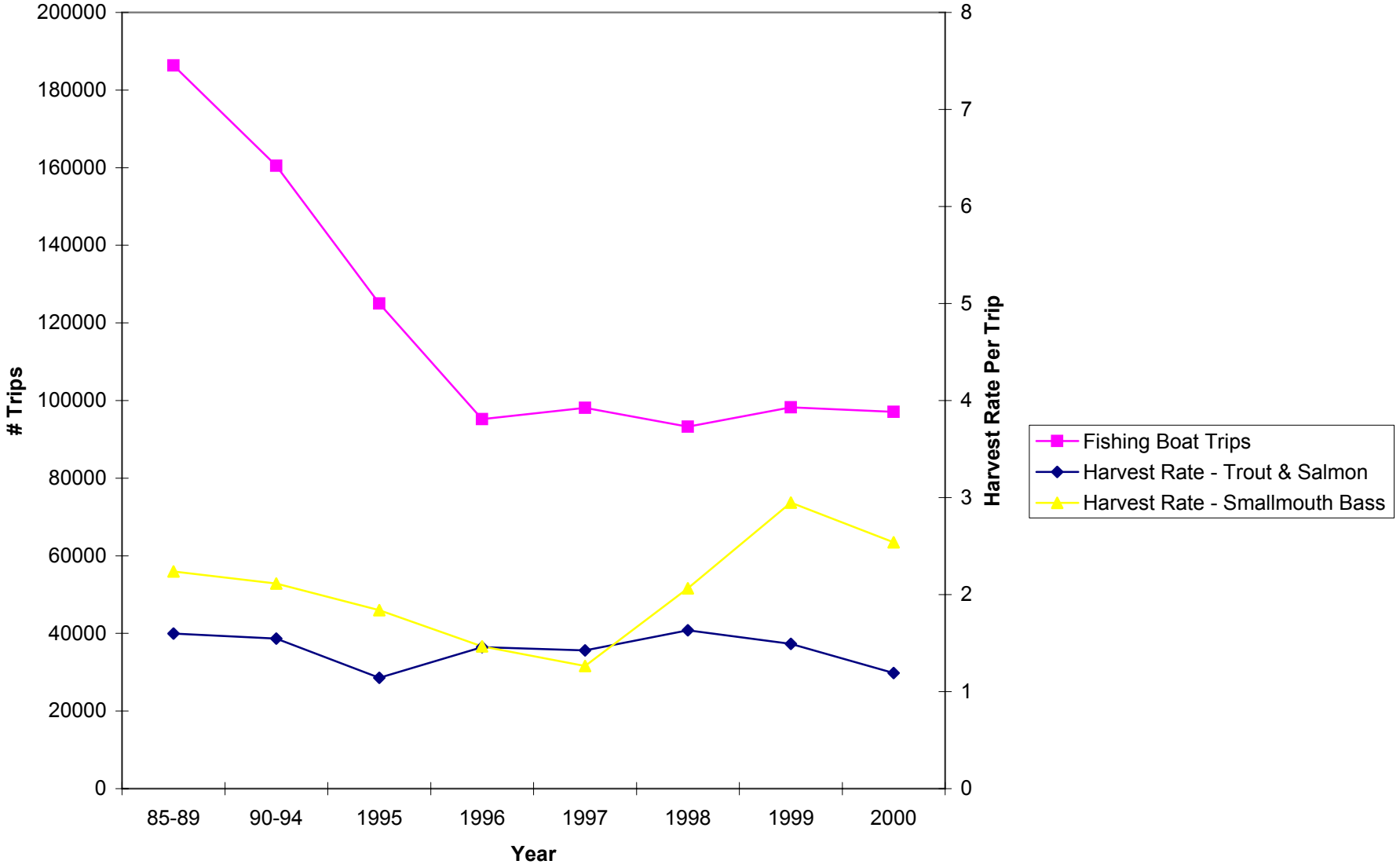

Figure 4. Number of fishing boat trips and harvest rate from NYSDEC Lake Ontario Fishingboat Census (April-Sept.).

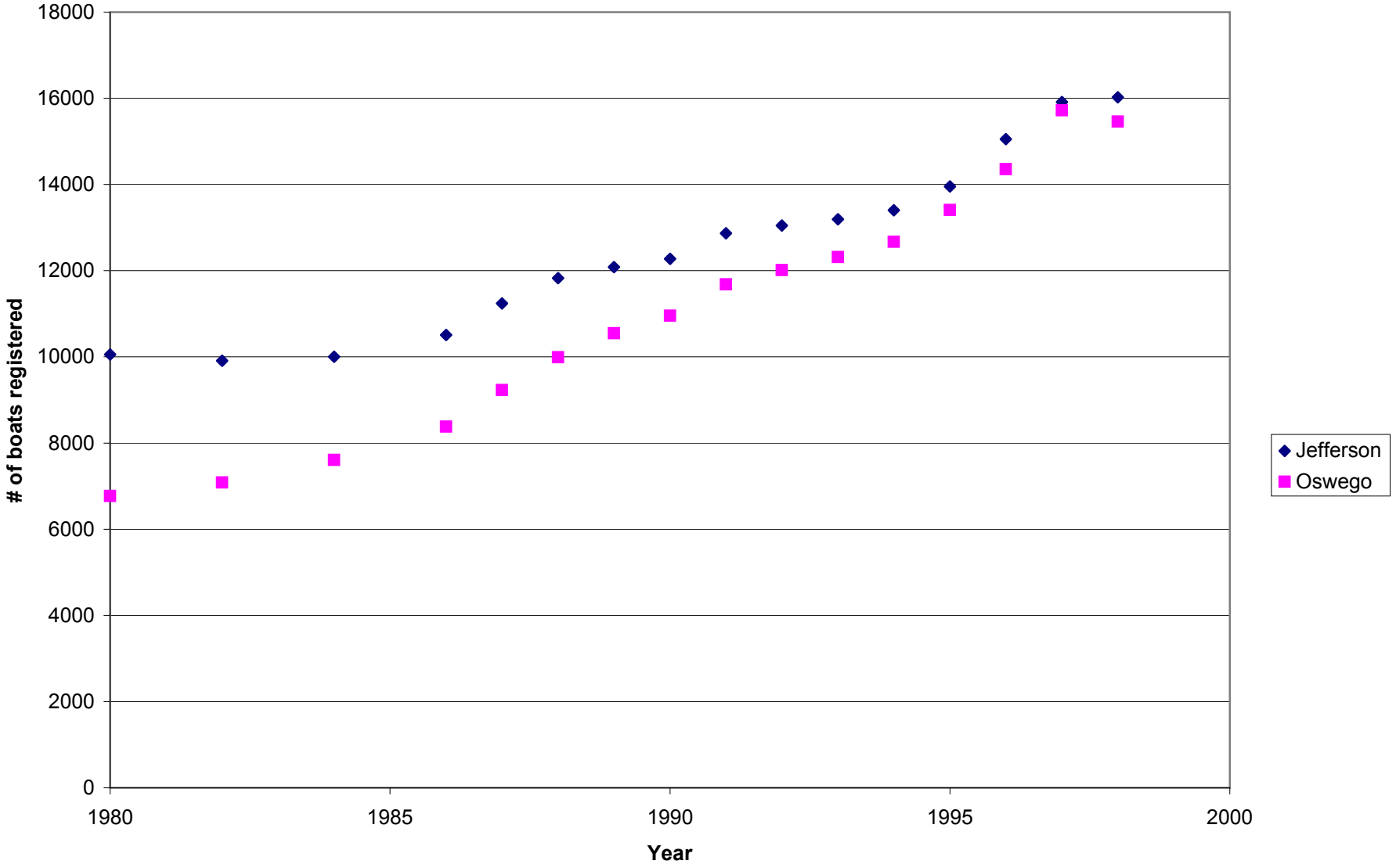

Figure 5. Number of boats registered by county of principal use.

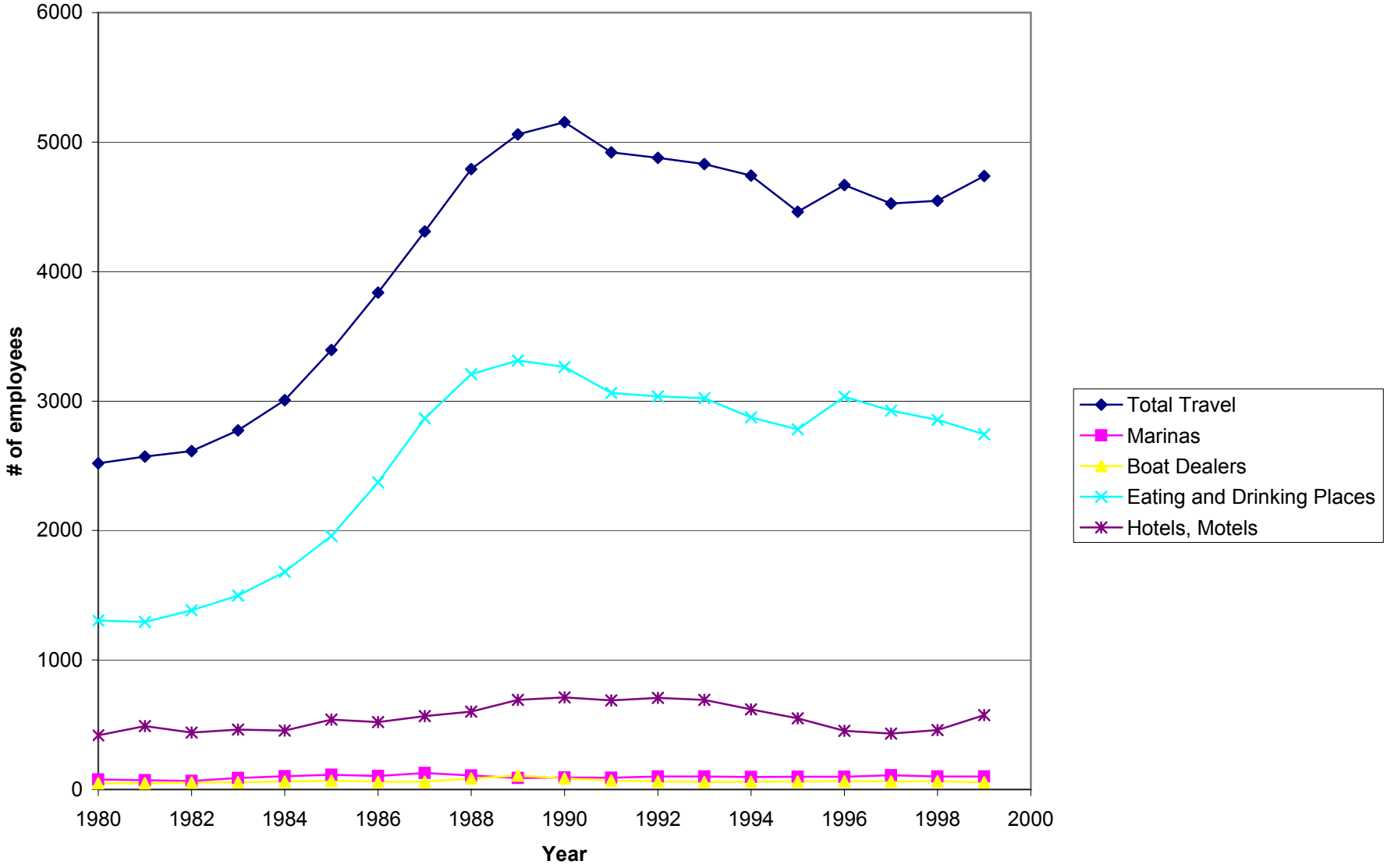

Figure 6. Annual average employment in Jefferson County by travel-related sectors.

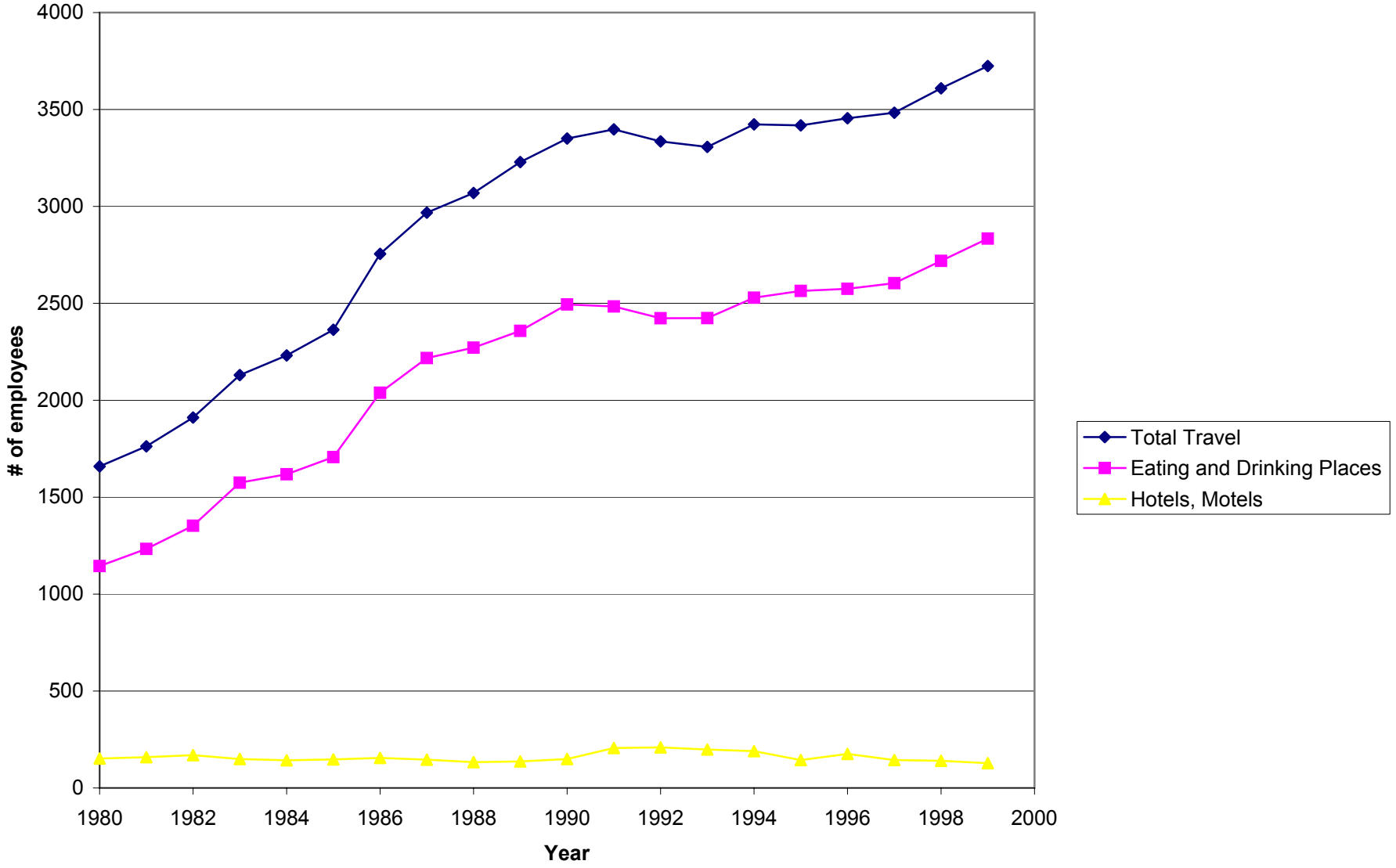

Figure 7. Annual average employment in Oswego County by travel-related sectors.

to 1996. These numbers are significantly different at the 95% level of confidence. Given the data on number of individual anglers and the concerns brought by coastal businesses, we will assume that the difference between 1988 and 1996 estimates are accurate. Statistically, there is equal probability of greater versus lesser losses than the estimates shown in Table 3. Based on this assumption, angler expenditures in constant 1996 dollars declined by $1.93 million in Jefferson County, and by $5.03 million in Oswego County, or by $6.96 million in the two counties between 1988 and 1996.

Table 3. Comparison of Lake Ontario fishing effort, 1988 and 1996, from New York statewide angler surveys (includes resident and non-resident anglers).

	1988	1996	Difference 1996 - 1988
JEFFERSON COUNTY			
Number of anglers	36,786	24,603	-12,183 (-33%)
(95% confidence level, + or -)	(3,971)	(3,396)	
Mean days fished per angler	8.5	11.7	3.2 (38%)
Total angler days	313,634	287,998	25636 (-8%)
(95% confidence level, + or -)	(49,281)	(62,850)	
Per Day At-Site Expenditures in '96 dollars	$34.51	$30.87	-$ 3.64 (-11%)
Total At-Site Expenditures in '96 dollars	$10,823,509	$8,890,498	$1,933,011 (-18%)
(95% confidence level, + or -)	(3,680,345)	($2,745,439)	
Percent of anglers fishing at least 1 day for:			% Difference
Yellow perch	25.3	27.5	2.2
Walleye	3.7	34.5	30.8
Bass	53.0	66.5	13.5
Northern pike	15.5	18.5	3.0
Lake trout	26.2	20.5	-5.7
Rainbow/steelhead trout	7.9	8.5	0.6
Brown trout	11.0	10.0	-1.0
Coho or chinook salmon	22.6	19.0	-3.6
Atlantic/landlocked salmon	5.8	4.5	-1.3
Bullheads/catfish	12.8	10.0	-2.8

Table 3 (Continued).

OSWEGO COUNTY	1988	1996	Difference 1996 - 1988
Number of anglers	78,030	39,9463	-38,084 (-49%)
(95% confidence level, + or -)	(5,661)	(4,289)	
Mean days fished per angler	9.0	9.9	10.0 (10%)
Total angler days	705,586	395,334	-310,252 (-44%)
(95% confidence level, + or -)	(102,548)	(58,923)	
Per Day At-Site Expenditures in '96 dollars	$31.92	$44.25	12.33 (39%)
Total At-Site Expenditures in '96 dollars	$22,522,305	$17,493,530	-$5,028,776 (-22%)
(95% confidence level, + or -)	($3,680,345)	($2,745,439)	
Percent of anglers fishing at least 1 day for:			% Difference
Yellow perch	6.4	9.7	3.3
Walleye	2.3	11.2	8.9
Bass	16.3	26.1	9.8
Northern pike	6.0	7.0	1.0
Lake trout	31.9	31.5	-0.4
Rainbow/steelhead trout	26.1	29.4	3.3
Brown trout	35.3	34.5	-0.8
Coho or chinook salmon	49.1	53.6	4.5
Atlantic/landlocked salmon	15.6	18.2	2.6
Bullheads/catfish	5.8	6.1	0.3

Table 3 also documents differences in fishing effort by species between 1988 and 1996. Substantial development of a walleye fishery occurred in the Eastern Basin during that period. Only 3.4% of anglers fishing in the Jefferson County waters of Lake Ontario reported fishing at least one day for walleyes in 1986. By 1996, over one-third of all anglers (34.5%) reported fishing for walleyes. Both counties reported increases in the proportion of anglers spending at least one day fishing for bass and walleyes between 1988 and 1996.

We estimated the proportion of the nearly $26.4 million in angler-related expenditures (or business-related sales) in 1996 that occurred in various sectors by averaging proportions reported in the New York portion of the 1991 U.S. Fish and Wildlife Service survey and the 1989 Salmon River survey, as indicated in the Methods section of this report. These estimated proportions are shown in column 1 of Table 4. We then allocated the $26.38 million in angler expenditures from the 1996 statewide angler survey into those sectors (column 2 of Table 4). Finally, assuming

anglers allocated their expenditures similarly in 1988 and 1996, we estimated the dollar decline in angler expenditures or business sales by sector and reported that in column 3 of Table 4.

Table 4. Estimated proportion of angler trip expenses by category, total trip-related expenses in 1996,[1] and 1988-1996 decline in constant 1996 dollars.

Category	Percent (1)	Total 1996 Expenditures (Millions) (2)	Estimated Decline 1996 vs. 1988 (3)
Fishing tackle, bait (Sporting goods stores)	11.8	$ 3.11	$ 821,000
Boating-related expenses (Marinas)	11.9	3.14	828,000
Automobile fuel and expenses	16.5	4.35	1,149,000
Lodging	20.2	5.33	1,406,000
Restaurant - Bar	18.4	4.85	1,281,000
Groceries	6.1	1.61	425,000
Charterboat and guide fees	7.9	2.08	550,000
Miscellaneous retail expenses	7.2	1.90	501,000
Total	100.0 %	$ 26.38	$6,961,000

[1] Percent of angler expenditures by sector based on average of 1989 Salmon River data and 1991 U.S. Fish and Wildlife Service national survey data for angler trips made in New York State.

Survey Results: Changes in Business Activity from 1996 to 2001

Of the 306 questionnaires mailed for the survey to estimate changes in sales of coastal recreation businesses, 11 were undeliverable, 4 were returned by former owners indicating the business had closed, and 130 completed questionnaires were returned. This resulted in an adjusted response rate of 45%. Twelve additional surveys were completed by telephone, resulting in a data set with 142 cases. This represents 49% of businesses that had the potential to respond. A concerted effort was made to reach more businesses by phone, but many operators simply were not available during the holiday period of mid to late December when contacts were attempted.

Description of Tourism-related Businesses

Businesses whose owners responded to the survey were classified based on the percent of sales in various categories (Table 5). Many responding businesses (80) provided accommodations or food, and 58 businesses provided charterboat or guide services. Because the type of services a business provides likely influences the degree to which it is impacted by changes in the fishery, we classified businesses for further analysis based on the category in which *the majority of sales* occurred (column 2 of Table 5). Then, using the *names* of businesses that did not respond to the survey, we attempted to classify those businesses into one of the four business categories shown in Table 5, so that we could estimate the total number of businesses by type. That list (column 4 of Table 5) contained 291 businesses, almost half of which we classified as primarily providing accommodations and/or food.

The 34 responding marina businesses were evenly split as to being located in Jefferson versus Oswego County. Two-thirds of responding charterboat and guide services had business addresses in Oswego County, but we do not know in which county they conducted most of their business. Accommodation and food businesses were rather evenly split between counties, with a few more located in Oswego County. Almost all retail sales (e.g., sporting goods) businesses that responded to our survey were located in Oswego County.

Table 5. Distribution of businesses chosen for the mail survey by business type.

Business Type	Number of responding businesses indicating sales: Some sales (1)	Majority of sales (2)	Number of nonresponding businesses classified using business name (3)	Estimated number of total businesses (4)
Marina	34	19	8	27
Charterboat/Guide Services	58	48	34	82
Charterboat	46			
Guide Services	26			
Accommodations & Food	80	55	80	135
Lodging	61			
Campgrounds	17			
Restaurants	19			
Other Retail Sales	37	20	27	47
TOTAL		142	149	291

Over half of the accommodations, food, and retail sales businesses indicated they were open year-round (Table 6), whereas most of the marinas, charterboat, and guide services were seasonal. The average opening and closing dates were primarily May and October, respectively. A few businesses indicated they opened in the fall and closed in late winter / early spring.

Respondents were asked to provide employment data by (1) year-round versus seasonal, (2) part-time versus full-time, and (3) owners versus paid employees. Expanding the data from the responding businesses to the entire sample of 291 businesses, we show in Table 7 the estimated number of employees for each grouping. Our analysis implies that over 2,000 people were employed in tourism-related businesses associated with eastern Lake Ontario in 2001. Differences in hiring practices by business type are evident and expected. For example, charterboat/guide services have few paid employees, whereas accommodations and food services depend heavily on paid employees.

Table 6. Operation schedule by business type.

		For Seasonal Businesses	
Businesses with majority of sales in:	Percent Open Year-round	Average Starting Month	Average Closing Month
Marinas	21%	April	October
Charterboat/Guide Services	21%	May	October*
Accommodations & Food	51%	May	October*
Other Retail Sales	55%	May	September

*A few businesses indicated a fall opening and late winter/early spring closing.

Several respondents to the survey indicated that they were no longer in business. It is impossible to know whether all nonrespondents were in business at the time of the survey. However, we do have some information about business turnover and start-ups from a question on the survey that asked how sales have changed since 1996. Businesses that did not have records for 1996 were asked to indicate the first year after 1996 for which they had records. We assumed that the year they indicated was the year they began operation. We found that 25% of accommodation, food, and retail sales businesses began operation between 1997 and 2001. This percentage was slightly lower for marinas (21%), and much lower for charterboat/guide services (6%).

Table 7. Estimated total number of workers in survey sample by business type.

Businesses with majority of sales in:	Year-round		Seasonal Only		
	Full time	Part time	Full time	Part time	Total
Marinas					
Owners	14	3	21	3	41
Paid Employees	37	1	39	30	107
Charterboat/Guide Services					
Owners	43	2	57	6	108
Paid Employees	4	4	4	18	30
Accommodations & Food					
Owners	115	22	22	20	179
Paid Employees	228	377	242	385	1,232
Other Retail Sales					
Owners	63	22	8	0	93
Paid Employees	61	155	33	190	439
TOTAL	565	586	426	652	2,229

The sample for this survey was drawn in an attempt to identify businesses influenced by their proximity to the eastern basin of Lake Ontario. A question aimed at independently measuring that influence found that almost all respondents identified boating or fishing as moderate or strong factors for the success of their business. Obviously, boating was a strong factor for marinas and trout and salmon fishing was a strong factor for charterboat and guide services (Table 8). However, most businesses also felt the general economy had a significant effect on their success in recent years. Most responding businesses felt that Fort Drum had none or only a slight impact on their success.

Estimated Percent Changes in Business Sales, 1996-2001

Respondents who had sales records for 1996 were asked to compare sales in each subsequent year through 2001 to sales in 1996. They were asked if sales had increased or decreased, and they were asked to estimate the percent change. A majority of marinas indicated a decrease in sales for 1997 through 1999 compared with 1996 (Table 9). Most charterboat and guide services indicated a decrease in 2000-2001 from 1996. For 1997-1999, 50% or less indicated a decrease from 1996 sales. On the other hand, the majority of accommodations, food, and other retail service businesses indicated an increase in sales for each year (1997 - 2001), compared with 1996.

Table 8. Importance of various factors to business success by business type.

Importance of Factors to Business Success	Businesses with majority of sales in: Marinas	Charterboat/ Guide Services	Accommodations & Food	Other Retail Sales
	Mean[a]			
General economy	3.3	3.4	2.8	3.0
Fort Drum	1.8	1.2	1.4	1.6
tourism (vs. local trade)	2.8	3.1	3.3	3.4
boating	3.7	2.3	2.5	3.0
bass and walleye fishing	2.8	2.8	2.4	2.6
trout and salmon fishing	2.7	3.8	3.0	3.4

[a]Measured on a 4-point scale where 1=not at all and 4=strongly.

Table 9. For the years 1997 through 2001, the percent of businesses indicating a decrease in sales compared with 1996 by business type.

Businesses with majority of sales in:	1997	1998	1999	2000	2001
	Percent indicating a decrease in sales from 1996				
Marinas	70.0	60.0	54.5	27.3	41.7
Charterboat/Guide Services	38.5	50.0	45.9	54.1	71.1
Accommodations & Food	25.0	30.6	31.4	40.0	41.2
Other Retail Sales	40.0	33.3	33.3	33.3	53.3

We took the percent change estimated by businesses for each year since 1996 and applied an inflation factor derived from the Consumer Price Index so that data could be compared in constant 1996 dollars. The average change in sales from 1996 is shown in Figure 8 by business type. Sales compared to 1996 have remained constant for the accommodations and food sector. However, marinas have had sales of about 10% below 1996 levels. Charterboat and guide services indicated a decline in sales compared with 1996, which became more precipitous in 2000 and 2001. "Other retail sales" was the only sector to indicate significant positive increases compared with 1996, although sales dropped in 2000 and 2001 from the 1999 level. The range in answers for this sector was particularly wide with some businesses indicating large increases compared to 1996 and others indicating decreases.

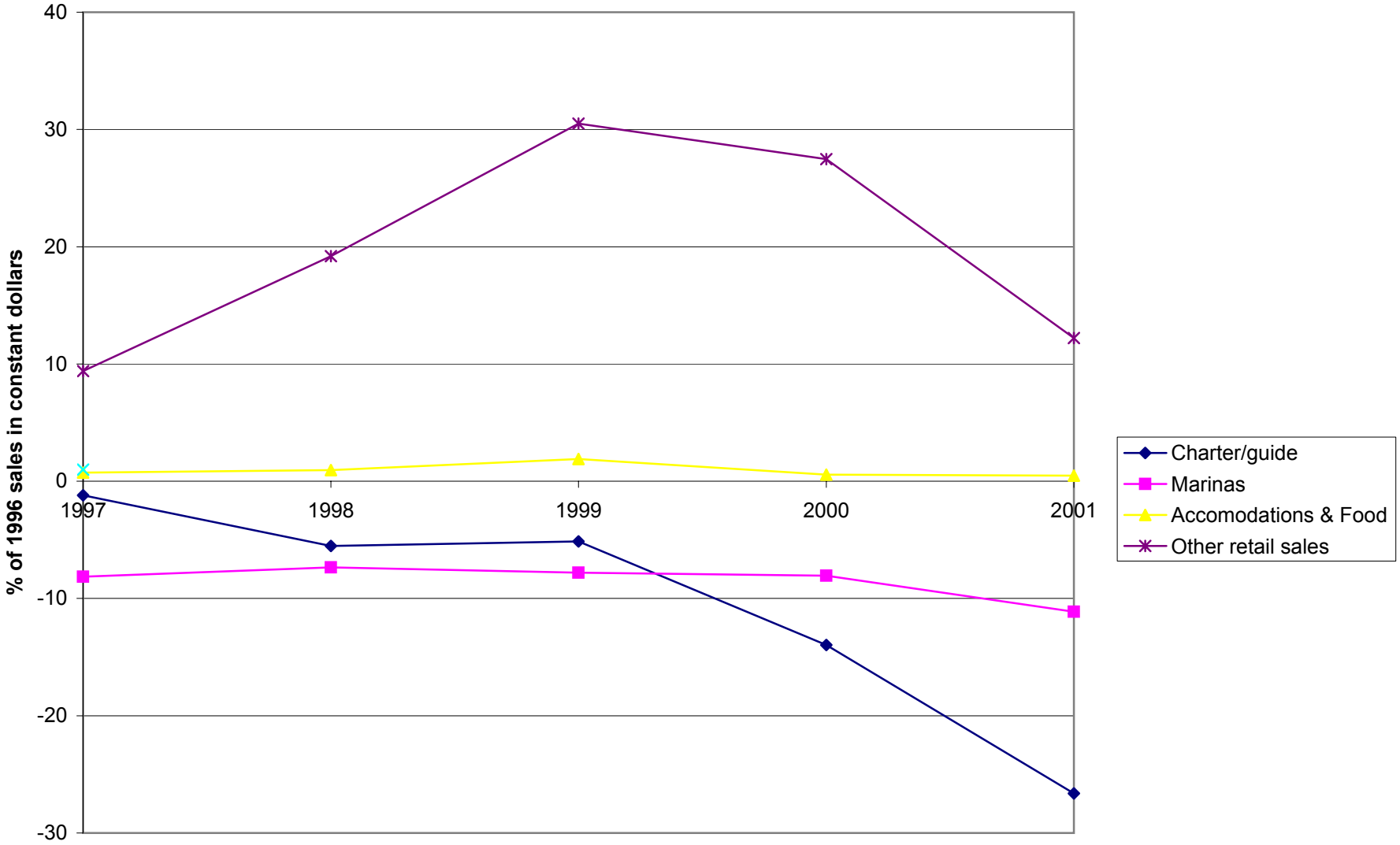

Figure 8. Average percent change in sales in 1997 through 2001 compared with 1996 sales and adjusted for inflation, by business type.

Some differences in sales were observed between counties, with marinas in Oswego County reporting slightly larger decreases in sales than in Jefferson County (Table 10). The difference was reversed for accommodations and food services with slightly positive numbers for Oswego County and slightly negative numbers for Jefferson County. The general decrease in charterboat and guide services over time was particularly pronounced for businesses with addresses in Jefferson County.

Table 10. Percent of 1996 sales in constant dollars for 1997 through 2001 by business type and county.

Businesses with	% of 1996 Sales in Constant Dollars				
majority of sales in:[a]	1997	1998	1999	2000	2001
Marinas					
Jefferson	-3.6	-3.6	-5.2	-6.7	-5.6
Oswego	-12.0	-10.6	-10.0	-9.2	-16.7
Charterboat/Guide Services					
Jefferson	0.0	-4.8	-3.5	-20.7	-32.5
Oswego	-2.0	-6.0	-6.1	-9.7	-22.8
Accommodations & Food					
Jefferson	2.3	-4.7	-6.0	-7.4	-11.9
Oswego	-0.1	3.9	6.0	4.7	6.6

[a]Insufficient sample for comparison by county of "other retail sales".

The difference in sales for businesses that indicated fishing is strongly or moderately important, compared to businesses for which fishing was not important or only slightly important, is clearly evident in Figure 9. Those for which fishing was important had on average a decrease in sales in all subsequent years compared with 1996, and a marked decline in 2000 and 2001. The few businesses in our sample for which fishing was at most slightly important, on average, had increases in sales for all years compared with 1996. The trend for businesses for which fishing was important was similar regardless of whether trout and salmon, or bass and walleye were of greater importance to these businesses.

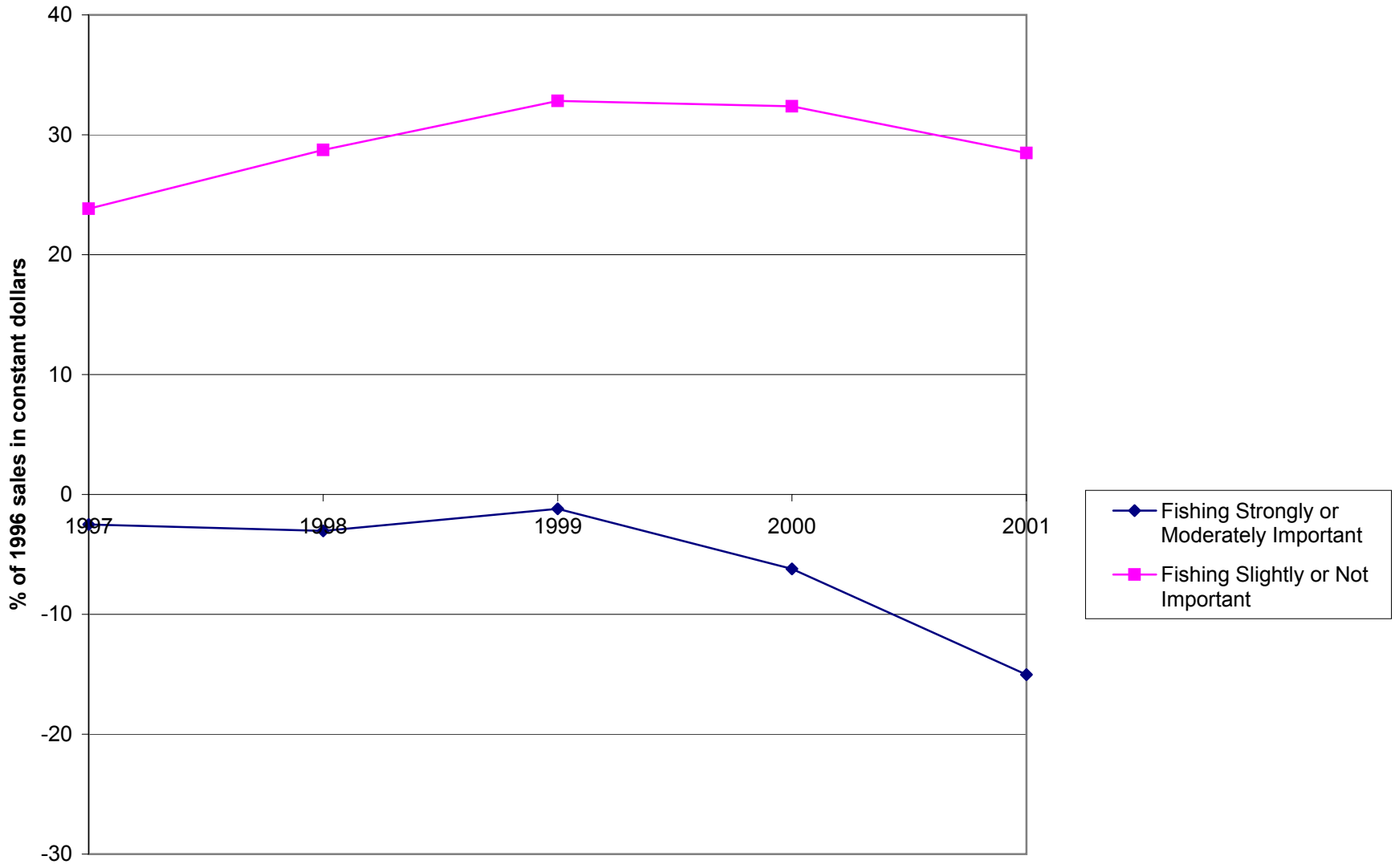

Figure 9. Average percent change in sales in 1997 through 2001 compared with 1996 sales and adjusted for inflation by importance of fishing to business success.

Respondents were asked to indicate possible reasons for both the increases and decreases in business they reported. The most important reason for increased sales for a majority of businesses was word of mouth or increased repeat business (Table 11). Improved marketing was mentioned by many businesses and expanded products or services was particularly common among marinas and other retail sales businesses. Increased tourism was not perceived by many as a reason for increased sales. Other reasons that respondents wrote in included improved facilities and services, increased fees, and good fishing.

Fewer fish for anglers due to cormorant depredation was the most commonly cited reason for decreased sales (Table 11). This reason was mentioned by 85% of charterboat/guide service operators and many respondents in other business sectors. Interestingly, cormorant depredation was checked by significantly more Jefferson County businesses (88%) than Oswego County businesses (51%). Two-fifths of respondents indicated a general decline in the economy and changing patterns in location of fish as reasons for declining sales. As would be expected, fish location was more likely to be important to marina owners and charterboat/guide services. General decreases in tourism was mentioned by one-third of respondents. Almost half of the respondents gave a reason not on the original list, primary among those reasons was a general decline in the number of fish which they did not attribute to a specific cause like cormorants or water quality. Other respondents also said a lack of fish was a reason for decreased sales but they attributed it to decreased stocking. Another reason mentioned by several respondents was perceived over-enforcement by DEC officers.

Estimating Dollar Change in Sales, 1996-2001

Not all business sectors that serve anglers experienced declines between 1996 and 2001. This is because tourism in the region generally was increasing during this time. However, the businesses that experienced gains in constant dollar business volume between 1996 and 2001, if they had the capacity for additional business, would have experienced even greater sales if the total number of anglers had remained constant or increased.

From data in Table 4 and Figure 8, marinas in constant dollars have experienced additional losses in every year from 1996 to the present, and in 2001 lost nearly $350,000. Charter and guide services declined even more steeply and lost roughly $555,000 in 2001 from 1996 levels. We have no way to estimate losses to food, lodging, and other retail service establishments because anglers, while an important clientele, would likely constitute a minority of the total clientele of these businesses.

Table 11. Positive and negative reasons for changes in sales--overall and by business type.

Reasons for			Businesses with majority of sales in			
	Overall	Most Important Overall	Marinas	Charterboat/ Guide Services	Accommo-dations & Food	Other Retail Sales
Increasing Sales	Percent					
Word of mouth or increased repeat business	85.0	60.4	71.4	96.4	81.8	85.7
Improved marketing	38.0	5.5	28.6	42.9	31.8	57.1
Expanded products or services	33.7	17.6	60.0	25.0	25.0	50.0*
Increased overall tourism	11.1	3.3	0.0	3.6	18.2	14.3
Other reason	19.0	13.2	15.4	0.0	34.1	14.3
Decreasing Sales						
Fewer fish for anglers due to cormorant depredation	66.7	41.2	50.0	84.8	61.5	40.0*
General decline in the economy	40.7	14.7	33.3	48.5	26.9	60.0
Changing patterns in location of fish due to factors such as increased water clarity	40.7	4.4	41.7	57.6	26.9	20.0*
Decrease in tourism generally	33.3	10.3	8.3	42.4	30.8	40.0
Other reason	45.7	29.4	41.7	45.5	50.0	40.0

*Statistically significant difference between business types using chi-square test at P = 0.05.

Estimated Total Annual Impacts of Fishing Declines

A conservative estimate of the total annual dollar losses from the 1986 level of fishing activity in Jefferson and Oswego Counties through 2001 would be $7.87 million in constant 1996 dollars, or about $8.70 million in constant 2002 dollars. This is the sum of the 1988 to 1996 declines in fishing (from Table 4), plus the additional estimated losses from 1996 to 2001 to the marina and charter fishing sectors. This estimate is conservative because it does not include other trip-related expenditures anglers would have made had they used marinas and had they gone charterfishing in 2001 at 1996 levels. We have no measure of the decline in angler trips and as a result can not estimate the further declines in what 1996-level of anglers would have spent for food, lodging, bait and tackle, and other miscellaneous retail purchases.

Because the IMPLAN economic impact model uses 1998 data, we will convert the data in Column 3 of Table 4 from 1996 to 1998 dollars (Table 12). All indirect impacts of these expenditures that are stated in dollar terms will be in 1998 dollars.

Table 13 summarizes IMPLAN's estimates of the direct, indirect, induced, and total impact of a reduction of $8,178,000 in spending on the two-county economy when the spending occurs in the sectors that we have estimated for angler expenditures in 1988. The indirect effects reflect the loss of purchase of goods and services from within the region by businesses. The induced effects denote less spending by households, primarily, who would have received some of the angler expenditures as income and would have respent a portion of those dollars locally. Thus, the total impact of the $8,178,000 decline in expenditures is estimated at $10,945,393. The total sales or output multiplier, then, is the total impact divided by the direct impact, or 1.34. IMPLAN uses a social accounting matrix (SAM). The SAM, rather than the older Type I and Type II multipliers, internalizes into the model not only business and household expenditures, but also nonmarket transfers such as taxes, transfer of funds from government to people, and transfer of some funds from people to people.

The loss of over $8 million in direct funds and almost $11 million in total dollar impact can also be thought of in terms of jobs or employment impacts. IMPLAN estimates this loss as being the equivalent of 186.1 direct jobs, or 227.4 total jobs. These are not all full-time jobs but are a combination of full-time and part-time jobs. This measure attempts to be consistent with other estimates published in sources such as County Business patterns and the U.S. Department of Commerce Bureau of Economic Analysis's Regional Economic Information System (REIS). The labor income loss resulting from these reduced expenditures is also shown in Table 13, broken down into typical income to employees and income to proprietors.

Table 12. Estimated economic declines in fishing in Jefferson and Oswego Counties, 2001 compared to 1986, represented in 1998 constant dollars.

Category	Total Dollar Declines by Sector
Fishing tackle, bait (Sporting goods stores)	$ 853,000
Boating-related expenses (Marinas)	1,225,000
Automobile fuel and expenses	1,194,000
Lodging	1,462,000
Restaurant - Bar	1,332,000
Groceries	442,000
Charterboat and guide fees	1,149,000
Miscellaneous retail expenses	521,000
Total	$ 8,178,000

Table 13. Direct, indirect, induced, and total economic impact of $8,178,000 decline in fishing-related expenditures in Jefferson and Oswego Counties between 1988 and 2001.

	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Output (sales)	$8,178,000	$ 1,166,688	$1,600,705	$10,945,393
Annual jobs	186.1	15.6	25.7	227.4
Labor Income	$3,072,372	$431,303	$622,976	$4,126,651
a. Employees	$2,521,098	$333,706	$520,799	$3,375,603
b. Proprietors	$ 551,274	$ 97,597	$102,177	$ 751,047

DISCUSSION

The limited funding and timetable for conducting this research necessitated the use of one type of data—angler-reported expenditures— for the 1988 to 1996 interval, supplemented by a different type of data—reported impacts by businesses—for the 1996 to 2001 interval. In addition to possible biases in what anglers report in angler surveys, or what business people report in business surveys, there sometimes are additional biases, the nature of which may not be fully understood, associated with changing from one trend data source to another and trying to reconcile the two sources. We believe the data sources we used, including the follow-up business survey, were the best options available to us to make this assessment.

Although there are opportunities for biases both in the reporting of data and in generalizing from respondents to everyone in the survey population, we feel reasonably confident that we have documented at the correct order of magnitude a large decline in coastal fishing and boating-related activity over the 13-year period between 1988 and 2001. Probably most of the jobs referred to in Table 13 would be seasonal jobs, but nevertheless, a decline of over 200 jobs, associated with direct receipts of $8.7 million and total economic activity in the region of almost $11 million, indicates the importance of sportfishing to the local economy.

This study was funded in large part by a desire to see an estimate of the extent to which this decline in fishing, particularly in Jefferson County, was due to depredation of double crested cormorants on smallmouth bass and other species. There is evidence from DEC biological data that cormorants are having some impact. The business community believes that cormorants are having an impact, and that anglers believe cormorants are affecting their fishing success. Cormorants have received a substantial amount of publicity by the media, which may well have influenced angler beliefs independent of anglers' actual experience. Putting a dollar value on the portion of the decline that is attributable to cormorants is impossible, however.

Trends in fishing in New York and across the Great Lakes between 1988 and 1996 are different for the Great Lakes versus inland waters. Fishing effort was down across the Great Lakes during this period. Indeed, the decline for Jefferson County was less than that for areas of Lake Ontario. However, the fact that tourism outside of fishing was reasonably strong in the area, and the large increase in fishing effort on the St. Lawrence River suggests that fishing may well have been substantially better in the Lake Ontario portion on Lake Ontario without the direct effect of the cormorants, the negative media publicity generated by the cormorants, and increased water clarity factors that influenced fish habitat and locations.

We don’t have the data to specify the reasons for declines in Great Lakes fishing with certainty, but some additional factors may also be operating. Demographic trends plus a lower recruitment of youth into fishing in recent years may be a factor. The negative media attention given to factors other than cormorants, such as zebra mussels and other exotics, and lowered productivity of the lakes, may also be a factor. And for some anglers, the novelty of Great Lakes fishing, especially for salmonids, simply may have worn off.

We believe that expanded cormorant populations are a cause for concern and that controls are badly needed. At the same time, we recommend that the fisheries community and community economic interests take a closer look at the broader factors that are affecting Great Lakes fishing, and try to determine the extent to which strategies can be developed to reverse this trend.

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